

ENTERING AND EDITING FORMULAS

Formulas add intelligence to a workbook. Using formulas, you can manipulate values (text, numbers, or dates), perform simple or complex calculations, and display alternative results based on logical tests. A formula can be as simple as a reference to another cell, or it can go on for hundreds of characters, with as many as seven functions nested within other functions. Regardless of its complexity, however, a formula must begin with an equal sign (=). If you start a formula with a plus sign (+) or minus sign (-), Excel adds an equal sign to the beginning of the formula.

Formulas consist of three basic building blocks: *operands* (the elements to be calculated), *operators*, and *worksheet functions*:

- **Operands**—The data to be calculated in a formula can include any combination of the following: *constant values* (numbers, text, or dates you enter directly in a cell or formula, for example); cell or range references; names that refer to cells or ranges; or worksheet functions. When you use a cell or range reference in a formula, Excel substitutes the contents of that address the same as if you had typed it in directly.
- **Operators**—Formulas can use any of six basic arithmetic operators: addition (+), subtraction (-), multiplication (*), division (/), percent (%), or exponentiation (^). You can also use comparison operators to compare two values and produce the logical result TRUE or FALSE. The list of comparison operators consists of equal to (=), greater than (>), less than (<), greater than or equal to (>=), less than or equal to (<=), and not equal to (<>). Use an ampersand (&) to combine, or concatenate, two pieces of text into a single value.
- **Worksheet functions**—Predefined formulas that allow you to perform calculations on worksheet data by entering a constant value or a cell or range reference as the *argument* that a named function transforms. You can use a worksheet function as the complete contents of a cell, or you can use a function as an operand in another formula.

→ For a full discussion of worksheet functions and arguments, see "Manipulating Data with Worksheet Functions," p. 604.

USING CELL REFERENCES

You can enter any cell or range address directly in a formula. These addresses are not case sensitive; if you enter a2:b8 in a formula, Excel converts the entry to A2:B8 when you press Enter. You can also point and click to enter any cell or range reference.

One of the simplest Excel formulas is a direct reference to another cell. If you click in cell I24, for example, and enter the formula =A5, Excel displays the current value of cell A5 in cell I24. This technique is most commonly used with worksheets that contain input cells in which you type data that you'll use throughout the worksheet. For example, cell A5 might contain the current interest rate you plan to use as part of a series of loan and payment calculations. If you use custom views to display different portions of your worksheet, this technique lets you see the underlying assumptions at a glance.

To enter a reference to an entire row or column, use the row number or column letter as both halves of the range reference: B:B for column B, 2:2 for row 2. You can also use this syntax for multiple rows or columns—B:K includes every cell in columns B through K, just as 10:13 includes every cell in rows 10 through 13.

ABSOLUTE VERSUS RELATIVE CELL REFERENCES

Normally, Excel interprets cell and range references within a formula as *relative references*. When you copy or move the formula, Excel automatically adjusts cell references to reflect their position relative to the new location. This capability is useful when you need to quickly copy a formula across several rows or columns. In the worksheet shown in Figure 20.1, for example, the formula in cell D13 totals the contents of D7 through D12. When you copy that formula across to the right, Excel assumes you want to total the numbers in the same relative position in each column, so it adjusts the formula accordingly, from =SUM(D7:D12) to =SUM(E7:E12), =SUM(F7:F12), and so on.

Figure 20.1
Relative cell addresses are automatically updated as they are copied from cell to cell.

B7		fx: =SUM(B2:B6)				
	A	B	C	D	E	F
1	Year	North	South	East	West	Grand Total
2	2011	5,630	5,680	6,600	4,760	22,670
3	2012	6,120	4,810	6,610	6,790	24,330
4	2013	3,650	5,520	5,870	3,360	18,400
5	2014	6,590	6,470	5,120	4,660	22,840
6	2015	5,600	6,530	4,830	4,180	21,140
7	Total	27,590	29,210	29,030	23,750	109,580

→ The easiest way to copy a row or column of formulas is with the help of Excel's AutoFill feature; see "Automatically Filling In a Series of Data," p. 519.

In some cases, however, you want to copy a formula so that a cell or range reference in the copied formula points to the same cell or range as in the original. For example, if you enter the current interest rate in a cell near the top of a loan worksheet, you can refer to that cell in any formula that makes an interest-related calculation. To convert a relative reference to an *absolute reference*, which does not adjust when copied or moved, use dollar signs within the cell address. For example, when you copy the formula =B4*\$A\$5 to the right, Excel adjusts the first cell reference relative to its new location, but leaves the second reference unchanged: =B5*\$A\$5, =B6*\$A\$5, and so on.

TIP FROM

EQ & Woody

When you want to include a reference to an input cell in several formulas, you're generally better off using a named range, which is always an absolute reference. If cell A5 contains an interest rate, name the cell *Interest_Rate* and use that name in formulas—=B6*Interest_Rate, for example. If you move or copy the formula, the reference to the named range will not change.

You can mix and match relative and absolute addresses in a formula, or even in the same address. Using a dollar sign in front of the column portion of the address (\$A5) tells Excel to change only the row reference when the formula is moved or copied; likewise, a dollar